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Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials

Vol. IV MAY, 1940 No. 36

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"PLASTICS" is published in London, England, at the beginning of each month.

Head Offices: Bowling Green Lane, London, E.C.1.
Inland Telegrams: "*Pressimus, Smith, London.*"
Cables - - "*Pressimus, London.*"
Telephone - *Terminus 3636 (Private Exchange).*

Midland Office — 50, Hertford Street, Coventry.
Telephone—Coventry 60095 (2 lines).
Telegrams—"*Presswork, Coventry.*"

Northern Offices—Manchester: Deansgate House, 274, Deansgate.
Telephone—Blackfriars 5038-9.
Telegrams—"*Presswork, Manchester.*"

SUBSCRIPTION—"PLASTICS" will be mailed regularly to any address in the United Kingdom or abroad for—
Twelve issues for 15s. post free; Canada and Newfoundland 12 for 13s. 6d.; pro rata for fewer numbers.

COMMUNICATIONS—All letters regarding subscriptions, advertisements and other business matters must be addressed to The Manager, Bowling Green Lane, London, E.C.1.

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Bowling Green Lane, London, E.C.1.

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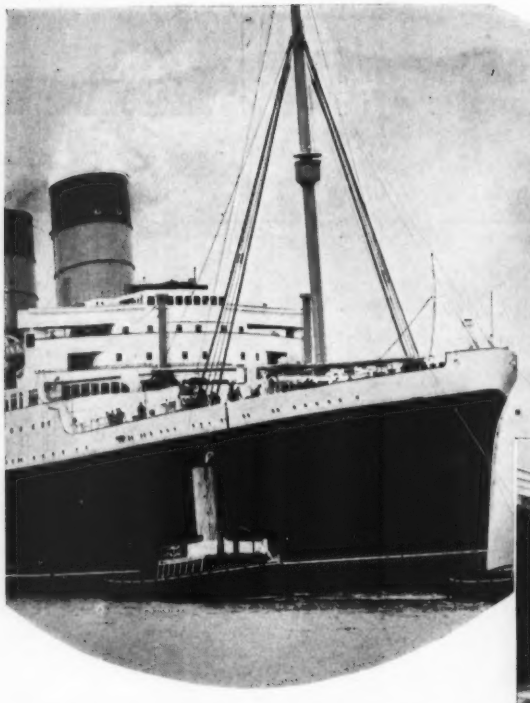

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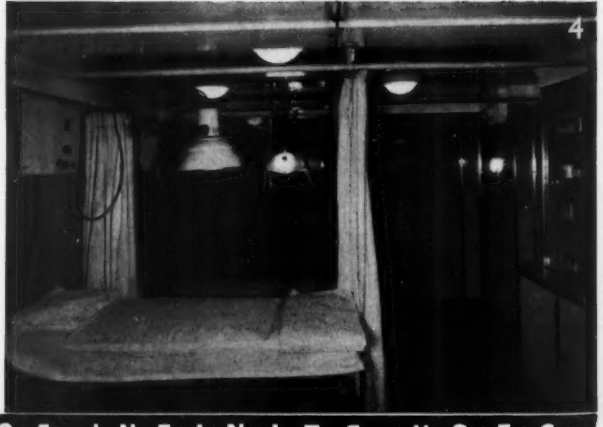
VENEERS AND WALL PANELS
for ships' interiors and furniture



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THE MATERIAL OF INFINITE USES

Vol. IV. No. 36 MAY, 1940

Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials

Proprietors - - TEMPLE PRESS LIMITED
Managing Director - ROLAND E. DANGERFIELD

Editor - - M. D. CURWEN, B.Sc., A.I.C.
Offices - Bowling Green Lane, London, E.C.1

Steel v. Plastics

THOSE who had the pleasure last month of listening to Mr. Potter, of Bakelite, Ltd., at the Royal Society of Arts also had the good fortune to hear Dr. W. H. Hatfield, who presided at the meeting.

Dr. W. H. Hatfield is not only one of the greatest metallurgists and physicists in industry—he directs the research of the Brown-Firth Laboratories—but he has a delicious sense of humour. Pretending a fear for his own metallurgical future by the growth of plastics, he asked the output figures of our industry and whether they approached those for the production of steel. Without blinking at all he told us that the present consumption of the latter was of the order of—100,000,000 tons, we believe he said!

On being told by Mr. Potter that the output of plastics had not yet reached that figure, Dr. Hatfield gave a sigh of relief and settled himself more comfortably in his chair. He was satisfied that with its product at 2d. per pound the steel industry was safe—for the present.

As with chemical materials, production figures for plastics are difficult to obtain. It has been stated that in this country synthetic resins, cellulose compounds, casein, etc., were manufactured to the value of £2,000,000 in 1935 and about £3,000,000 by 1937. It is difficult to assess this by weight, since it has not been divulged if this sum includes filler. The total weight would be in the neighbourhood of 20,000 to 30,000 tons.

It is, however, worth while comparing the two industries, although from many points of view they are not comparable. Plastics, according to their character and properties, sell at prices ranging between, say, 1s. to 10s. per pound, and they give value for money. Manufacturers pay the price for exactly the same reason that they pay more for copper or leather than for steel—they are rarer, more costly to prepare, and they serve the purpose in view best.

Plastics are worth the money for a hundred reasons we have already given in these pages. Some are excellent dielectrics, all are about a fifth to a sixth the weight of steel, some are acid or alkali resisting, some are transparent, some are petrol resistant, some are chosen for their beauty of colour, all can be moulded into desirable forms for industrial and other uses.

So that even steel at 2d. per pound is being replaced by plastics at 1s. per pound, because the public have demanded a more suitable product for the job under consideration. And just as the brass door handle and brass electric switch cover have almost disappeared since 1920, so will those applications of steel disappear where steel is not the ideal material. Such is progress.

Those applications may be very numerous, but we must admit that the total quantity of plastics that will be employed will never be as great as the almost fantastically large output of steel—at least, in the lives of most of us living. Our capacity for production is severely limited—at least, in part. The greatest portion of plastics now made, the phenolic type, depends on coal almost completely, and although the output of coal in this country is about 220,000,000 tons, the larger part of this is exported, and only a very small portion of the remainder is treated for the extraction of phenol direct.

All other plastics, too, are made directly or indirectly from coal, with the exception of celluloid. Even cellulose acetate needs acetic acid, made indirectly from coal. In fact, all synthetic organic plastics, whether of the urea, styrene, vinyl, coumarone or nylon type, need coal or coal tar products in their manufacture.

The plastics industry is, therefore, limited by coal production, by the unscientific use of coal, and, therefore, by the limited quantities of its products that are available. On the other hand, it can easily expand to twice its present output and more in time of peace without any disorganization.

Timberless Houses

IN a current issue of *The Builder* a writer gives details of the new proposal by the Liverpool City Council for the building of 20 experimental houses of the non-parlour type. The experiment is unique in that it is proposed, because of the drastic reduction of timber imports, to replace timber as far as possible by introducing home-made products.

Substitution of timber has already taken place in the erection of houses, e,g., steel windows, steel door frames and metal and tile surrounds to fireplaces, but the new savings will be still greater, for hollow pre-cast concrete beams, steel joists, tiles and patent flooring on concrete will be general. Window frames will be of steel, and the door frames, although partly of timber, will also contain steel, and the panels will be of glass or metal. Stairs will be on concrete, and the sink and drainer of stainless steel or stoneware.

It is somewhat surprising that no mention at all is made of plastics, with the exception of the w.c. seats, which will be of "bakelite," although, presumably, some of the other fittings, such as door knobs, etc., will automatically be of phenolic or urea material.

The plastic drainer has been a success for many years, and the moulded resin flushing cistern is already on the market. The omission of laminated sheet from any

specification is, perhaps, excusable, since the houses are obviously of the cheap type, and laminated sheet is not a low-priced constructional material yet, but even so we should have liked to have seen its entry into such houses, the beauty of which would be enhanced thereby in a manner concrete and paint could never hope to copy. We believe, too, that a properly designed door could be made with a panelling of laminated sheet, and would cost no more than the proposed ones.

Perhaps the most interesting point with regard to the new proposal is the fabrication of hollow beams from concrete. Obviously the matter has been carefully calculated by the engineers, but their adoption appears to support the contention that timber and steel can be replaced if proper calculations are made and even that plastic beams are by no means completely out of the question.

Nylon Toothbrushes

NYLON, hailed in America and awaited in Great Britain as the new high-grade fibre for the textile trade, will first reach the public not in the anticipated form of stockings, but as toothbrushes. Two British manufacturers, Messrs. Addis and Messrs. Halex, Ltd., are marketing, towards the end of May, toothbrushes which in appearance will not differ from their well-known products. As already indicated, nylon is being developed by Imperial Chemical Industries, Ltd.

Raw nylon, bristles made therefrom and the finished toothbrushes.

The significance of the use of this new material for synthetic bristle manufacture lies in the superiority of nylon over natural bristles and in the fact that they are made from an indigenous material — like dyestuffs, nylon is derived ultimately from coal. Nylon brushes will retail at the normal prices of high-grade brushes.

Nylon is one of the major achievements of chemical research during the present century. The name is not a branded one but a generic term for a whole range of new materials. It is a word in the same class as "wood." There are, indeed, almost as many different kinds of nylon as of wood. Synthetic bristles are one form of nylon, and like all nylons are extremely tough, wearing better than hog bristles. In a machine simulating the use of a toothbrush, the abrasion and fatigue resistance is such that after 7,000 scrubs the nylon brush is intact, with every tuft in place and only a few fibres out of alignment, whereas a high-grade hog bristle brush has lost many of its bristles. The synthetic bristles do not break off or split in service.

In hygiene as well as in strength, nylon outrivals natural bristle. It absorbs only one-fifth as much moisture as hog bristles and absorbs it more slowly. A hog bristle brush is almost completely saturated in three minutes whereas a nylon brush can be soaked in water for at least five minutes without perceptible loss of stiffness. The surface of nylon is smooth and does not become soggy and dirty in use; it is not susceptible to bacterial attack. It is chemically stable and resists the action of dentifrices. Any dentifrice which collects at the base of the knots can be removed by an occasional rinse in warm water. Nylon filaments, from which synthetic bristles are made, are water-white. As they are man-made, the diameters can be controlled to any desired thickness.

What must appeal to brush manufacturers of every kind is the fact that nylon synthetic bristles will be made from materials produced within the United Kingdom. During the past 20 years the natural supply of bristles from North China and Russia has not only been uncertain both as regards price and delivery, but has gradually diminished owing to the troubled economic and political conditions of the Far East. With the use of the British-made nylon quality will be uniform, and price fluctuations a thing of the past.

IMPORTANT NOTICE

We beg to point out that readers making technical inquiries necessitating a reply by post must enclose a stamped and addressed envelope. This also applies to contributions, photographs and samples not expressly requested by the Editor.

PLASTICS AND LIGHTING

Some notes regarding American practice of the use of moulded and sheet material for decorative and industrial purposes

Left: 10-in. diameter reflector bowl moulded of Beetle.

SINCE plastics are translucent in certain forms, they have many logical applications in artificial lighting, and in America such use is growing. Lighting, of course, is accompanied by heat, and when plastics are used near the light source the possible effects of heat must be considered. As the thermo-plastics soften at temperatures which are reached or exceeded at points near light sources of medium to large size, there are advantages in some cases in using thermo-setting plastics. In general, this narrows the choice to urea plastics, which combine translucency with ability to withstand temperatures higher than are permissible with most thermo-plastics. Fortunately, the ureas are available in white and in a degree of translucency equal to or better than that of opal glass. In such forms they transmit, diffuse and reflect about 83 per cent. of the light which falls upon them. The white surface reflects about 70 per cent. of the light reaching it. This makes the ureas especially suitable for semi-indirect lighting, or the form in which a part of the light is transmitted and diffused and part is reflected from the plastic surface, and again by white or light-coloured ceilings and wall surfaces.

Doubtless the largest use of ureas for lighting is in moulding globes, bowls or reflectors, which shield the light source and thus minimize glare. Extensive use has been made of so-called "I.E.S." lamps, approved by the (American) Illuminating Engineering Society for reading and similar purposes. The moulded bowl shields the light source in such a way that no rays from the light source reach the eye directly or fall directly on the object to be viewed, such as a book or sheet of writing paper, without being diffused by the globe. Other light, some of which is reflected from the surface of the bowl, strikes the ceiling of the room and illuminates the room as a whole, some of it being reflected by ceiling and walls to provide general lighting. This avoids too much contrast between the book or other surface viewed and other objects in the room. It creates a condition considered essential in avoiding glare and making for good seeing without eye strain.

I.E.S. lamps are now widely used in homes, studies and the like. Not all have urea globes, many still using opal glass, but the urea has an advantage in being light in weight and less fragile than the glass. A similar light for offices and commercial establishments is afforded by overhead globes, which have been moulded in urea in several diameters up to at least 26½ ins. Such globes weigh little and are easy to install, are not easily broken in transit, and are much less of a hazard in use than glass bowls, as they are not easily shattered by a blow, and if broken the pieces are light and unlikely to cause injury in falling.

Extensive use has been made of urea mouldings for lenses in dome and similar lights for closed passenger cars. Here, also, light weight, lack of fragility and availability in attractive forms, which are inexpensive to mould and afford good light transmission, are important factors favouring plastics as opposed to glass. More recent are applications in railway passenger coaches. In these the primary light sources are placed in coves overhead and are shielded below by moulded urea louvres spaced about 1½ ins. apart. The louvres are bowed downward and have holes in the ends,

Moulded louvres for lighting system in Philadelphia subway coach. Above them are panels of laminated Beetle.

This photograph illustrates the translucence and light diffusing properties of laminated Beetle.

through which pass supporting rods. Eight louvres are carried on a pair of rods a foot long, and this assembly is designed for ready removal to permit of replacing lamps burned out. At the sides of the cove and above the louvres are strips of laminated urea, which transmit and diffuse other light. Further lighting is provided by vertical "pier" lights moulded from urea and placed between the windows.

Certain of the lighting effects at the New York World's Fair are produced by using translucent urea sheeting, which is now being furnished by various makers of laminated plastics.

Another use for urea mouldings in lighting has been found in making the supporting base for "Lumiline" lighting sources which are frosted glass tubes. There is also an extensive use of frosted sheets of cellulose acetate for making lampshades, especially for decorative purposes, the common type being pleated. Cast phenolics in transparent and other effects are applied in fabricated lamp bases.

British-made Lampshades

AS an accompanying note to the foregoing article, we have pleasure in publishing the attached photograph of lampshades manufactured in this country by J. S. Peress, Ltd., of High Street, Brentford, whose factory we had the pleasure of visiting last month. They have been moulded from Beetle or Scarab, and are particularly noteworthy for their ingenuity and beauty of design. S.S.1 to S.S.9 are for normal home use, and are reproduced in a variety of translucent pastel shades. The remaining four, S.R.1, S.R.2, S.S.12 and A.R.P. Special, are opaque and are products of war-time for black-out conditions.

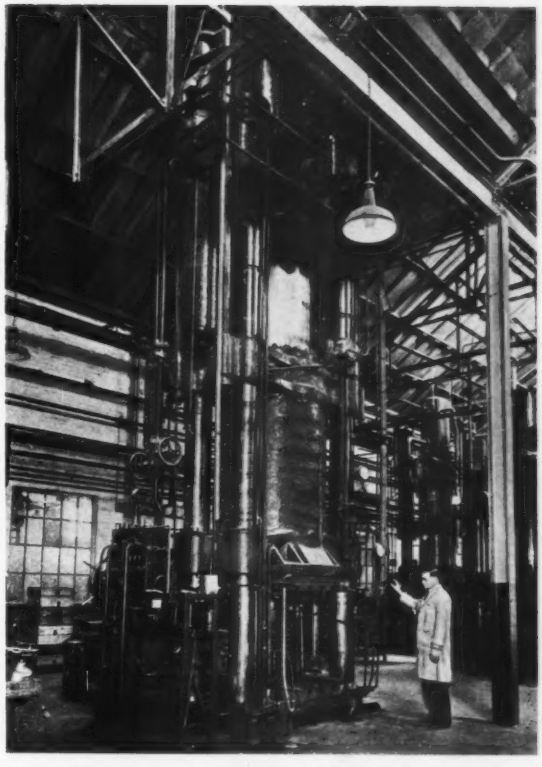
It is noteworthy that Mr. Peress is a specialist moulder and engineer of a very high order and moulds only lampshades. That this has been a wise course is strongly reflected in the fact that he supplies the largest multiple stores in the country and maintains a stock of some quarter of a million units! An examination of his products and of his moulds leaves one with the impression of a rare and fine craftsmanship.

New Works of Thomas de la Rue and Co., Ltd.

TO those outside it the plastics-moulding industry is still rather a closed book, from the point of view of the raw materials used therein and of the manner in which they are processed.

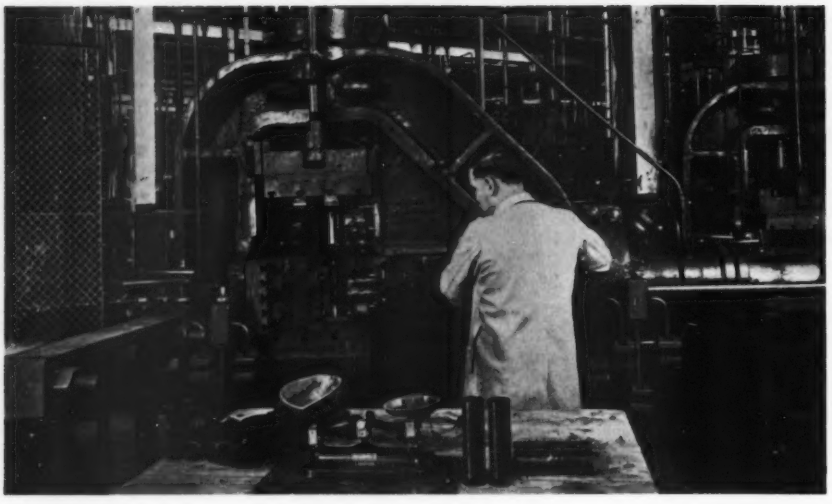
For those who run and see the history of this section of our industry can best be viewed, at least in part, within the few older concerns in the country where the whole gamut of older and newer raw materials are employed.

Typical of these is Thomas de la Rue and Co., Ltd., the famous printers of banknotes, stamps and playing cards, who some 25 years ago began a moulding department to supply the needs of the rapidly growing electrical industry for a material of construction other than ebonite, mica or porcelain. The properties of bitumen, asbestos and silica-dust mixtures had been examined, and it was found that they were readily mouldable by the "cold" process and gave structures that were of sufficiently high mechanical strength (tensile strength about 1,000 lb. per sq. in. and cross-break strength about 3,000 lb. per sq. in.) and possessed interesting electrical properties. The latter are not good compared with ebonite, but are sufficiently satisfactory for many purposes. The mouldings made from bitumen mixes are extremely rigid and strong, sufficiently so to give excellent service as terminal blocks, insulating bushes, panels and underground transmission parts. The weathering properties are such that they are widely used for overhead line insulators. The growth of the motorcar industry also provided a great fillip for these materials, which were soon employed to produce battery boxes and accumulator cases. The value of bitumen plastics may be gauged from the fact that their use is still widespread, in spite of the advent of superior dielectric substances. Bitumen plastics have their drawbacks, but they have their advantages and are cheap. It can be well imagined that such a moulding industry becomes, in effect, a branch of engineering, involving the study of high-pressure technique, and of design and production of steel dies.



The coming of Bakelite moulding powders then, because of their original applications in the electrical industry and because they were mouldable, albeit by a slightly different technique, proved merely a new material for the works of Thomas de la Rue and Co., Ltd., and concerns like them. It was the logical sequence of events. High-pressure presses utilizing heated moulds were introduced and when new applications for the raw materials were discovered and new markets were tapped, the experience in design of moulds was fruitful. It needed no change in technique to produce a cigarette box where fuseboxes had been

This shop contains some twenty side-ram presses of heavy type.



A close-up of a side-ram press and examples of the undercut mouldings that can be produced on it.

manufactured. And so when the spate of moulded components grew, of more complicated shape and of larger and larger size, Thomas de la Rue and Co., Ltd., proved equal to most demands. Urea moulding powders, cellulose-acetate polystyrene, methyl methacrylate were readily accepted in their turn and injection moulding presses were installed as the importance of the thermo-plastic compounds grew, and as the rapidity of the injection-moulding process proved an economically satisfying method.

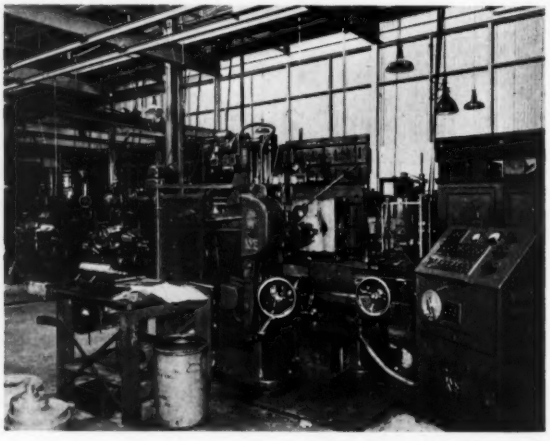
In 1938 the demands grew to such dimensions that it was decided to remove the moulding factory from its old site to a completely new one. The new factory, probably the most modern of its type in the country, stands as a monument to the plastics industry, a living example of the ingenuity of engineering science and of the national service furnished by what is an excellent example of exact and, on occasion, beautiful mass production.

The factory, which employs over 1,000 workers, contains over 200 presses, ranging from the small 50-100-ton high-compression pressure of normal type to the side-ram angle presses, which are so essential in producing mouldings with undercuts or side panels. There are numerous injection-moulding presses (we saw a host of electrical components being moulded while we watched) and, finally, several huge 850-ton presses and 2,200-ton presses. The introduction of these is, of course, the result of the gradual desire to produce very large moulded objects, such as radio cabinets working in tandem and motorcar facia boards. It will be remembered that, as indicated in our February, 1939, issue, the Sunbeam-Talbot facia board, weighing 3½ lb., was moulded on these large presses. During our visit a number of radio cabinets and escutcheons were being turned out on the larger presses.

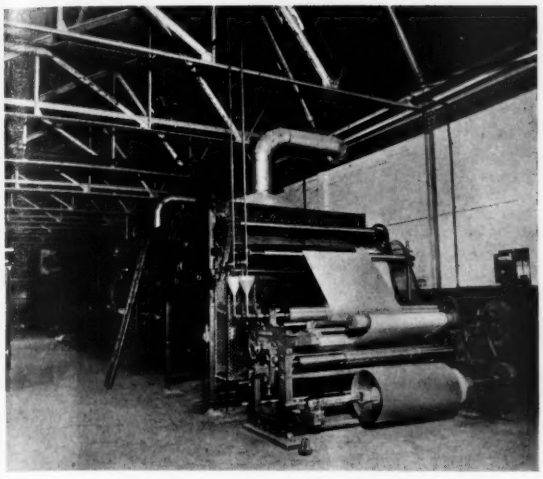
It can well be imagined that the transition from small to large presses was not a bed of roses, and the resolve to carry out such research is most praiseworthy. The results have warranted the introduction.

So far the history of Thomas de la Rue and Co., Ltd., has followed the purely moulding tradition. But

Some of the big presses on which radio cabinets are moulded.



A corner of the mould-making shop with Keller machine in foreground.



The new impregnating plant and—

—the press for sheet production.

we now see how, with a knowledge of the properties, chemical and physical, of synthetic resins, backed by a long experience of the electrical trade and the basic experience of engineering science, other developments may grow.

The latest of these is the introduction of a very modern paper-impregnating plant in the new factory. This has only recently been installed and, in fact, was undergoing its preliminary trials during our visit.

The process, which is probably already known to most of our readers, consists of passing a special paper through an alcoholic solution of phenol-formaldehyde resin and removing the solvent in an air-heated and conditioned chamber while the paper is passing through it. The emerging coated sheet is drawn on to rollers and then cut to size for the final curing and consolidation into boards of varying thicknesses. This latter process is carried out on the adjacent multiple daylight steam-heated presses seen above. The finished sheet is employed for electrical and other work.

No description would be complete without a word as to the ancillary departments of this concern, which, like most engineering works, must be fed with power as well as metal moulds and raw material, both of the organic and metallic variety, since inserts are so important and numerous.

As for power, Thomas de la Rue and Co., Ltd., claim that they possess the most modern pumping station in the country. For supplying pressure to the presses, a modern system of air bottles is employed, thus avoiding moving parts such as exist in those employing the usual weight system.

The workshops bear a close resemblance to any modern machine shop producing high-precision work and are fitted with all the modern equipment for manufacturing moulds. The latest introduction is another Keller die-sinking machine with its electrical control cabinet, a miraculous machine that produces dies by following the contours of a plaster casting made from a wooden original.

The Future

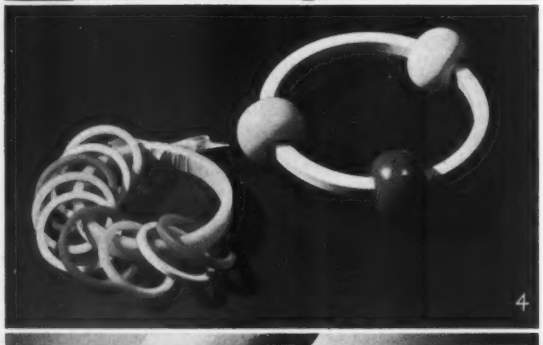
One might emphasize that, in large part, the future of the plastics-moulding industry lies in the hands of concerns such as Thomas de la Rue and Co., Ltd. Not that mere largeness of works and of capital is a direct criterion of this; not that individuals in the small works do not possess great vision or knowledge equal to any in the large works; but, given the vision and given the knowledge, the larger concerns with research facilities will always be in a better position to accept new ideas more readily and to carry on new processes a step farther. Therein lies the future of the industry—research, and yet more research, whether it is chemical, physical or engineering.

That Thomas de la Rue and Co., Ltd., is eminently suited to do its share in this work we have no doubt, an opinion considerably strengthened by a talk with Mr. H. Bridge, the director of the Plastics Department, whose long experience with the vast Gramophone Co., Ltd., has already stood him in stead.

Mr. Bridge has an enormous faith in the future of plastics. What is more, his ideas are not bound down by convention and we shall expect many interesting developments in the course of the next few years. He is particularly keen on the general question of constructional work carried out in modern high-strength materials and is convinced that a scientific consideration of the real problems will yet satisfy constructional engineers that plastics are within practical politics for many jobs.

It speaks well for the company and the industry that, in time of war (and Thomas de la Rue and Co., Ltd., are producing enormous quantities of moulded components for other than peace-time requirements), this director can talk deliberately of the probable direction of research and of possible applications in times of peace.

Mr. H. Bridge, director of the Plastics Department.



New Mouldings From the U.S.A.

A Selection of Some of the Most Recent and Interesting Mouldings Produced in America. These Include Several Mouldings which Received Awards in the Recent Modern Plastics Competition

1

FEATHERLIGHT and housed in colourful, transparent, translucent or opaque plastic cases, the sports watches designed and fabricated of Marblette by Multicolour Watch Mfg. Co., New York City, were considered worthy of Honourable Mention in the Novelty Section of the Fourth Annual Modern Plastics Competition. The great advantages of these watches are that they are stainless and the brilliant colours and finishes are permanent. Both wrist and lapel styles may be chosen in colours to match or contrast with sports apparel, and have received tremendous acceptance in fashion circles.

2

APPROVED wholeheartedly by the best-informed musical instrument dealers and music educational authorities in America, the moulded Durez Aman Recorder won for the Chicago Musical Instrument Co., Chicago, Ill., an Honourable Mention award in the Novelty Section of the recent Modern Plastics Competition. Durez is claimed to eliminate the mechanical difficulties of wood, yet retains a satisfactory degree of the acoustical properties. It is also more economical in use, especially when made up in the small quantities in which recorders are sold.

3

ENTIRELY transparent, except for the bearings and head, a roulette wheel, made by Keolyn Plastics Co., Chicago, Ill., U.S.A., was chosen by the judges at the Fourth Annual Modern Plastics Competition to receive an award in the Miscellaneous group of entries. The various parts that go to make up the complete piece were shaped from flat sheets of Lucite.

4

CLEVERLY designed to catch and hold the interest of the very young, these nursery toys, made of catalin and developed by R. M. Hay Co., New York City, were awarded Honourable Mention in the Novelty Division of the Fourth Annual Modern Plastics Competition. These toys are, of course, non-inflammable, odourless, tasteless, stainproof and washable. They will not chip or peel, and the smooth, rounded edges are easy on baby's mouth and fingers.

5

THIS dripless syrup container will be a welcome addition to the kitchen. Both closure and handle are moulded of Tenite supplied by Tennessee Eastman Corporation. The container is equally efficient when used in pouring cream, salad oils or syrups, the Stop-Drip closure fits closely to the glass or ceramic pitcher. The plastic material from which it is made is easy to clean and will retain its fresh appetizing colour indefinitely.

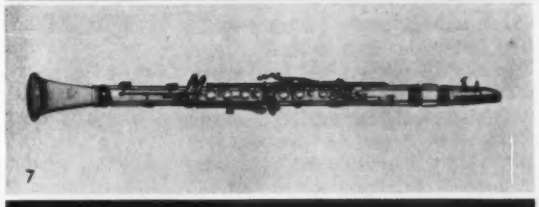
6

THIS display case, which is also a travel case, does double duty for the new Gem razor and shaving brush combination. The transparent top is of Monsanto cellulose acetate and the package was made for Gem by Hygienol Co., Inc., 120, West 44th Street, New York, U.S.A. The moulded container for the actual safety razor is moulded of phenol-formaldehyde resin and specially designed for convenience and appearance. The base or handle of the shaving brush is moulded of cellulose acetate.

6

7

DISTINCTIVE and rich in appearance and with exceptional musical qualities, the transparent Lucite Clarinet produced by the Pedler Co., Elkhart, Ind., was selected from entries in the Scientific Classification to receive Honourable Mention in the Fourth Annual Modern Plastics Competition. Representing an outstanding achievement in the music industry, this clarinet is rapidly becoming popular with both amateur and professional musicians. The mouthpiece, moulded from the same material, has the appearance of the glass mouthpiece so long regarded with favour, but is more durable.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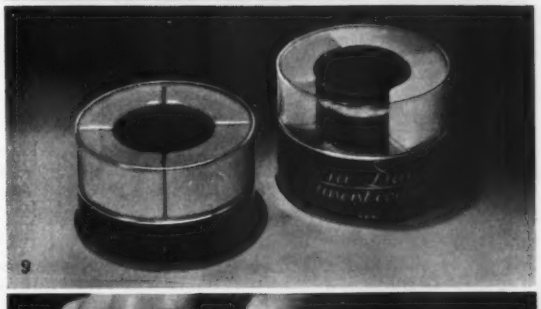
THE Master Humider, which is designed and sold by the Master Plastic Corporation, St. Louis, Missouri, U.S.A., ensures freshness at all times in tobacco and cigarettes by means of a vapour-control humidifying unit. This unit, moulded of cellulose acetate, is so designed that vapour escapes from the well and plug only when dry air and tobacco in the jar exert enough suction power to draw it out. Upon reaching a relative humidity of between 55 degrees and 65 degrees the contents of the jar no longer have sufficient suction power to draw the vapour through the plug. Thus the vapour supply is automatically shut off. The transparent water container on the top of the jar needs refilling only about every three or four weeks.

8

9

THIS is an unusual and yet eminently serviceable soap package making full use of cellulose acetate material. The combination of a handsome printed black and gold base with a transparent top of rigid acetate is uniquely adapted to a counter display, emphasizing the fact that each package contains a complete treatment consisting of the soap, sponge and a jar of treatment compound. A companion package of similar construction contains four cakes of the special soap. These packages were made by A. Dorfman Company, 57, West 19th Street, New York.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10

CAPITALIZING on the fact that the average car owner cannot remember his licence number, Leroco, Inc., of 236, West 55th Street, New York, have produced a permanent reminder in the form of a miniature licence plate in cellulose acetate. The front of the licence is protected by a window of transparent acetate sheet material. The acetate used for this ingenious application was manufactured by Monsanto, Inc., U.S.A., who are now energetically promoting new applications of thermo-plastics in the U.S.A.

10

WORLD'S INDUSTRIAL

SHIPBUILDING

Neoprene in shipbuilding offers many advantages states Dr. J. E. Holmstrom in a paper dealing with "the Chemist and the Ship," recently published in The Transactions of the Institute of Marine Engineers. The superior oil-resistance of neoprene enables resilient mountings to be employed under conditions where natural rubber would rapidly fail, and trials are in progress using neoprene suspensions for large marine Diesel engines and high-speed pumps. It is suggested that similar methods could be used for the prevention of hull vibration and metal fatigue in high-speed craft, and for the alleviation of compressional strain developed in various circumstances. Under conditions where shock absorption, as distinct from vibration damping, becomes important, the higher hysteresis of neoprene makes it superior to rubber in applications such as gun mountings and recoil mechanisms. The effective bonding of neoprene to metals renders possible the manufacture of laminated neoprene metal sheets; these would be expected to show high shock-resisting properties and might find special applications in ship construction. The resistance of neoprene to oil enables its successful use in a number of applications where rubber would fail, such as for oil seals and gaskets, including cork gaskets, in which the cork granules are bonded together with neoprene, and for valve diaphragms. A good report has been received on the wearing qualities of neoprene air-pump valves in resisting corrosion under oily conditions. The aeronautical industry has developed the use of neoprene strips for the caulking of points where welding is inadmissible, and it is possible that a similar method may be of interest to that of the shipbuilder. Large quantities of neoprene oil hose are at present being manufactured, the material being resistant not only to oil but also to weathering (a factor of particular prominence in the tropics), so that the problem of storing spares becomes much easier. The fact that neoprene hose can be manufactured with a smooth bore free from internal wiring is a further advantage, enabling higher flow rates to be obtained with a given diameter. The superior ageing properties of neoprene render it suitable in a number of applications for which rubber is definitely unsuitable. Its use in unarmoured cable is at present attracting attention. At one time the greatest drawback to the V.I.R. cable lay in its relatively short life, which meant that vessels had to be refitted at least once during their life, but the improvements secured of late years through the use of organic acceleration and anti-oxidents, combined with strict scientific control of manufacture, have gone a long way towards overcoming this difficulty, and the life of armoured cables and lead-covered V.I.R. is to-day of a high order. In the case of unarmoured and uncovered flexible cables, where the effect of light plays an important part and where the cables are working under high temperature conditions, such as in stokeholds and engine-rooms, the use of neoprene as a sheathing is of interest. It has been suggested that a great saving in weight could be obtained through the replacement of lead armouring by neoprene or similar products and the suggestion would appear to be worthy of trial. Notwithstanding the relatively poor electrical characteristics of neoprene, satisfactory results have been obtained when using it as an insulator for voltages up to about 250. With higher voltages a rubber insulation protected by neoprene sheaths is usually employed. The production of conducting rubber sheaths by the incorporation of carbon black, etc., has recently attracted attention since static electricity is largely eliminated in this way and the leakages which give rise to so much corrosion trouble are largely overcome. Sheathings made from neoprene by a similar method give even higher conductivities. It is further suggested that an interesting use may be found for neoprene for bonding to metal. It can be bonded directly to brass and to a variety of metals, including iron and steel, nickel, chromium, lead, zinc and aluminium and its alloys by the use of chlorinated-rubber interlayer. Excellent adhesion is obtained equal to the strength of neoprene itself. The investigation of neoprene paint as an anti-fouling composition would be of interest, and the production of non-slip deck coverings, having excellent ageing properties, would appear to hold great promise. It has been stated that the "Empire Day" speedboat, the unofficial world record holder 400 Kg. class, piloted by E. Spurr in September, 1938, was equipped with a neoprene-coated hull as a protection against erosion and corrosion. It has been further reported that propellers which have been treated with neoprene paint have given excellent results, the scoring effect of sand and the pitting caused by cavitation being largely eliminated. Another interesting application of neoprene solution lies in its application in the construction of radiators, oil coolers, intercoolers, and the like, in which neoprene replaces brazing and soldering, the resilient properties of the neoprene bond giving increased protection against the deleterious effects of vibration.

ELECTRICAL

Important design improvements are announced by G.E.C. (U.S.A.) in their MI-9 metal-clad switchgear, constructed specially for industrial plants and public buildings. All buses and connections are now completely insulated: the main bus is covered with a moulded insulation having a dielectric strength greatly in excess of the 5,000-volt rating of the equipment; all bus connections are covered with two-piece moulded covers, which are filled with compound. As in previous models, silver-to-silver, high-pressure contacts minimize oxidation of contact surfaces. A screw-jack mechanism, which is built into the housing, raises and lowers the breaker. This can be manually or electrically operated. Mechanical interlocks, removable breakers, and isolated current transformers, buses and connections are also retained as features. Type MI-9 uses a G-E circuit breaker employing the oil blast principle of circuit interruption. The primary disconnecting devices are of the stud-and-socket type, with silver-to-silver, high-pressure line contacts. Stationary sockets are mounted in glazed, wet-process porcelain; movable contacts are the oil-circuit-breaker studs. Secondary disconnecting devices automatically connect or disconnect all the secondary connections when the breaker is raised or lowered in the housing. But making and breaking the circuit is always done by the breaker, for mechanical interlocks prevent disconnecting or reconnecting the breaker while it is closed. The breaker can be easily lowered by the built-in screw-jack mechanism on to a transfer truck and moved to a rack for inspection. Service interruptions during inspections are thus limited to the brief interval necessary to remove one breaker and replace it with another. An accessory inspection rack provides maximum accessibility for servicing, and every

TREMPLOYS PLASTICS

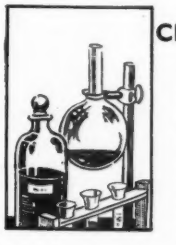
facility for electrical or mechanical operation of the breaker while it is removed from its housing. MI-9 switchgear is available for the protection of circuits up to 5,000 volts and 50,000 kva.

TEXTILES

Latex treated wool is described in a recent article by Dr. C. M. Blow in *Textile Mercury and Argus*, March 1, 1940. He states that research was initiated by the British Rubber Producers' Research Association and the Wool Industries Research Association jointly. Owing to the high cost of wool as compared with rubber it was realized at the outset that such application must result in wool being the predominant material in the finished products, i.e., that whereas such articles as tyres and hose are essentially rubber products, rubber-wool compositions must exhibit primarily the properties of wool. Further, as a high proportion of rubber deposited on wool produces a harsh feel, due to surface drag, improvement in the properties of the wool must be obtained by small applications of rubber. The wool was passed through a bath of suitable prepared dilute latex and deposition of the rubber particles on to the wool fibres took place, leaving a clear aqueous solution in the bath. No gumming together of the wool threads occurred after this treatment. Rubber latex consists of an aqueous dispersion of protein protected rubber particles negatively charged. As wool fibres are also negatively charged, it is necessary, in order to obtain deposition, to reverse the charge either in the latex particles or on the wool. In the instance under consideration this was effected by the introduction of a cationic soap into the latex which gives rise to positively charged latex particles, and positively charged dispersions of fillers can be obtained in a similar way. The positively charged latex is a stable material and vulcanized compounded latex can be used. The process can be applied to material in hank, cheese, fabric or carded form, and it is applicable to textiles other than wool, e.g., to jute. A uniform coating is obtained and the amount of rubber deposited is easily controlled. The deposited rubber has satisfactory ageing characteristics. Oxidation of the rubber coating does not, however, render the material useless. A harsh surface is produced when the rubber perishes, but this can be eliminated by a simple washing operation.

Yarn strength is normally obtained by twisting, which causes the yarn to lose fullness. The binding action of the latex produces high strength with low twist. The shape of the stress/strain curve for latex-treated yarns differs from that of twisted yarns of the same strength, lower extensions at low loadings being obtained.

Fabrics produced from latex-treated yarns have certain definite advantages. The abrasion-resisting properties of carpets are increased. In the case of garments, where the abrasion is low "pilling" is considerably reduced, and garments made from latex-treated wool retain their shade better than similar garments made from untreated yarn. Felts can be obtained which are more compact, and materials having characteristics of felts can be prepared from latex-treated jute and cotton.



CHEMICAL

Synthetic resin water softeners now being used in Germany for highly saline water. According to E. Seyd, *Chem. Fabrik*, January, 1940, p. 30, during the last 10 years base-exchange softening has developed from silicate to synthetic resin exchanges, with increase in efficiency as follows:—(1) a fourfold increase in throughput per unit volume; (2) lower resistance to flow, enabling deeper exchanger-beds to be used, due to the higher efficiency of coarser-grained material; (3) improved chemical resistance of the resin exchanger, which will now function with water at pH up to 9.5; (4) effective softening at higher temperatures; (5) increased life of the exchanger material. The modern synthetic resin exchanger may be said to mark the end of a definite stage in the evolution of water-softening processes. As the constitution of the resin exchanger can be adapted to suit the prevailing conditions, it may be said that not a single requirement in connection with base-exchange water-softening now remains unfulfilled.

There is no doubt that synthetic resin base-exchange materials will eventually find many more important applications in industry.

MISCELLANEOUS

Latex seat upholstery for service vehicles is now being manufactured on a large scale by Bintex, Ltd., Pannal, Harrogate. This particular type of rubber is the invention of Mr. William Binns, who has been experimenting with rubber productions for some 25 years. Before the war considerable quantities of Binlatex in sheet and moulded form was produced for public service and rail vehicles. The well-known firm of Hallam, Sleigh and Cheston, of Widney Works, Birmingham, is the sales organization to the vehicular trades for Binlatex.

Neoprene for sealing strips for doors and windows to prevent air leakage, noise, dust and odours is now being used in America. The seal consists of a neoprene tube or "tunnel" fitted into an aluminium track, which is fastened with screws to the door jamb or window. The neoprene strip is resilient, yet stiff enough to make a tight closure, and it is flexible enough to conform to surface irregularities of the door and window.

Resins for paint manufacture discussed by E. H. Bevan, B.Sc., in a recent paper reprinted from the Reports on the Progress of Applied Chemistry, Vol. XXIV, 1939, by the Oil and Colour Chemists' Association. It is stated that little or no advance is recorded during 1939 in the development of new types of phenol-formaldehyde resins. Bakelite, Ltd., patented a new process, B.P.491,519, in which is described a method of combining an oil-soluble phenol-formaldehyde resin with a drying oil. The polymerization is advanced to such a stage that more than 30 per cent. of the product is insoluble in acetone while still dispersible in a hydrocarbon solvent. In this manner films useful for primers and undercoatings are obtained, which harden directly by evaporation of volatile thinners. A number of new patents were taken out in 1939 for urea-formaldehyde resins. The combination of urea-formaldehyde resins with alkyd resins yields finishes which are not only hard and mark-proof, but possess good gloss and minimum discoloration under high bake conditions and excellent resistance to fats and thus form the basis of modern refrigerator white enamels. Renewed interest and development were shown in 1939 in the production of air-drying urea-formaldehyde lacquers by means of the introduction of acid catalysts. Considerable work was done on the alkyd resins also.

PLASTICS FOR THE ENGINEER

IN a paper read before the Royal Society of Arts, Wednesday, April 17, 1940, Mr. H. V. Potter, B.Sc., F.I.C., gave a valuable insight into the historical development and chemistry of the technical plastics, along with their many applications.

Dealing with their uses in modern building practice, Mr. Potter stated that so far plastic materials are not used in the building trade as main structures, chiefly on economic grounds. On a weight-strength basis they compare favourably with metals and wood, but are more costly at present, as in order to obtain the required strength against steel the equivalent weight would require a very large bulk of plastic material, too bulky to consider and far too expensive. Applications in the building trade are at present mostly for surfacing, either as wall panels, which may be natural wood finished or obtained with an imitation wood finish, or they may be finished in various bright colours. These are usually of a laminated structure with a paper base, but in the case of some thermo-plastic materials they are solid sheets. Panels of plastic materials are also used for such purposes as partitions, flush door surfaces, cupboard doors, shelves, window sills, skirtings and kicking boards, tops for tables, dressing tables, desks and other pieces of furniture, bath fronts and wash-basin splashboards. An example of a structural unit made from plastics is the fan, complete with casing, which is built up of individual mouldings assembled into one complete unit.

In railway engineering the "Royal Scot" and other famous trains employ plastic sheet to a large extent in the corridors of the coaches as well as on surfaces in the kitchen car, such as wall panelling, cupboards, table and counter tops, and in the cocktail lounge, such as wall panelling, table tops and window sills. One stressed member of particular interest is the fishplate insulator on the track of electrified lines. This is in continuous movement when trains pass over it. While it acts only as an insulating medium and not as a supporting medium, it is found that very heavy forces operate in this case, and great strength and durability are required.

Among the more prominent and established applications of plastics of direct interest to the mechanical engineer are:—

Silent and corrosion-resisting gears.
Roller mill bearings.
Vacuum-cleaner parts.
Pile-driver dollies (highly stressed).
Various automobile parts, both stressed and others.
Tool handles.

Plastic gears are used to reduce noise and are mounted to mesh with a metal gear and not with another plastic gear. In terms of phons the reduction of noise is about 65 per cent., and this represents a difference between the noise of a quiet office to that of an average restaurant. In addition, these plastic gears in many cases outlast in life their metal counterpart, while they are not affected by corrosive conditions, such as acid liquids or gases. They can be used to transmit several hundred horse-power or a fraction of 1 h.p., even so low as that in a small clock. Roller mill bearings are used in steel rolling mills because they last longer than those made of metal, and their lower coefficient of friction results in a saving of about 25 per cent. to 30 per cent. in power consumption. Referring briefly to the part played by plastics in the manufacture of domestic appliances, Mr. Potter stated that they were chosen for use in production of vacuum cleaners mainly because they enabled a considerable saving in weight to be effected without any loss of working efficiency.

Probably one of the most interesting of recent industrial applications is the use of plastics for pile-driving dollies. A pile driver is a machine with which it is difficult for the uninitiated to associate an application for plastics, and yet, as an example of resistance to compression in comparison with wood, it is difficult to illustrate one more favourable to plastics. This application enabled a contractor to drive steel piling to a predetermined depth in very hard ground after he had given up in despair any hope of getting the piles within feet of their objective. Normally steel helmets in pile drivers have a hard wood dolly. In this case the wood dolly crushed badly and even burst into flames. A block of phenol-resinoid laminated plastic was eventually used and was subjected to 120 blows per minute of 15,800 ft.-lb. per blow driving force; no mean achievement for any organic body. Six hours' continuous working was carried out until charring to destruction was experienced, due to heat set up by friction caused by the very uneven surface it was working on. Wooden dollies collapsed within a few minutes.

In the motorcar industry approximately 30 components of a modern car are now produced in plastics of different types. These have replaced either metals or wood in most cases. While the phenolic resinoids form the basis of most of the materials used in these industries, both methyl methacrylate and cellulose acetate are extensively used for windscreens of aircraft and automobiles in conjunction with glass, and even in the fuselage of aircraft as cockpit covers of the pure material.

Engineers' tools are now available in quantity fitted with moulded plastic handles, each of which outlasts its wooden counterpart many times. Moreover, it is cleaner to handle, and in cases where a good grip is required it is more efficient. Not only polished black, but other colours are used. The handle is moulded into the shank of the tool as the last operation in production, as in the case of its wooden opposite number. The ribbing on the handle, to give a good grip, is produced during the moulding of the handle all in one operation. Many machines, such as those used for boot making, sewing, bottling, nailing, labelling and stamping, are cam operated. The moving parts must be well balanced, and weight must be reduced to a minimum consistent with strength, in order to lower the inertia as much as possible. An increase in speed of operation is the general trend in many instances, and this has been assisted in many cases by the introduction of cams moulded from special phenolic resinoid laminated material. Accuracy of profile and balance are obtained in the moulding operation. Lubrication can be assisted by the introduction of graphite, and the many other properties, including lightness in weight, shock resistance, wear resistance and silent running, all play their part in helping the general speed-up of operation. Machines that could be run at 150 r.p.m. with metal cams have been speeded up to 150 to 500 r.p.m. by using plastic cams.

General view of the Causerie showing some of the tables topped with Orobello laid out with covers. The general smart appearance of this intimate little restaurant owes a good deal to the colour and novelty of the table tops.

OROBELLO FOR CLARIDGES

IN the October, 1939, issue of *Plastics* we first introduced to the industry a new and very beautiful plastic called Orobello, the work of an Italian craftsman, Mr. de Faveri. It will be remembered that we stressed the fact that the inventor claimed that his material was not only very suitable for wall-panelling, counter tops and ordinary mouldings, but for many other decorative purposes in hotels, cafés, restaurants, cinemas, etc.

In spite of the war, it is highly satisfactory to be able to record that a good deal of really practical interest has been aroused in Orobello and the first experimental order in the hotel field has just been completed. This has taken the form of 28 table tops for the new Causerie at Claridges Hotel. The actual tops are made up of small, rectangular pieces of Orobello, in green, black and brown mottle splashed with gold from the presence of brass filings and powder. These pieces are fitted so neatly together that the joints are hardly noticeable and in the centre of the table is a black star-shaped design. The whole effect is not only reminiscent of Italian mosaic, but the colouring is very restful to the eyes and in perfect harmony with the furnishing and decoration.

The management of Claridges considers that this new table-top material is very serviceable, as it shows no stains from hot dishes, alcoholic liquors, tea, coffee, etc., but is also unmarked when lighted cigarettes are left to burn on its surface. From the maintenance standpoint Orobello leaves little to be desired as it requires no polishing, only an occasional rub down with a dry cloth, which revives the characteristic patina lustre.

There is little doubt that the successful introduction of Orobello into the hotel field will lead to its adoption for other and possibly more ambitious decorative schemes. In spite of war and all the many troubles that it brings in its train, wine, women and song are not likely to be forgotten and the smart hotels will be well patronized. To the managements of these, novelty is the first qualification of any new material, and if this can be combined with beauty and serviceability, the chances of its adoption are bound to be good.

Close-up of the Orobello table top. Owing to the peculiar angle at which the photograph had to be taken a certain amount of distortion was unavoidable and in consequence it is difficult to distinguish the bluish-black central design.

DESIGN FOR THE MOULDED CAR BODY

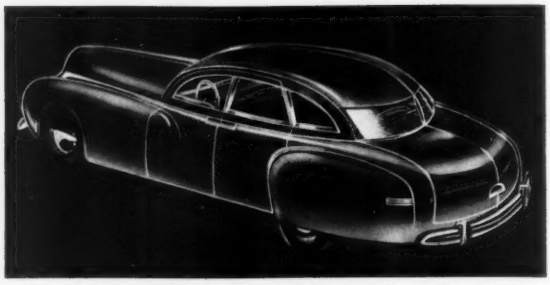
ACCORDING to *Automobile Topics*, March 4, 1940, motorcar bodies made of plastics with windows of the same material, making possible greater refinement of contours by eliminating flat panes of glass, is the prophecy of George W. Walker regarding the next phase of development in automobiles. Mr. Walker, well known for his industrial designs, who was retained two years ago by Nash-Kelvinator Corporation as consulting designer, foretold the advent of ultra-stylized motorcar bodies of coloured materials which will eliminate all need for painting, due to their construction.

Mr. Walker, who designed the 1939 and 1940 Nash cars, has already rendered into finished plans and drawings automobiles with bodies of these synthetic substances embodying curved aeroplane-type windshields and curved rear-vision windows of transparent plastics. He has felt for a long time, he says, that glass in automobiles should be replaced with some material which can be curved to "flow in" with the body lines of the car. With the development of "organic glass" such a substance is available and one which is also very clear and almost unbreakable. Another feature of this glass which ordinary glass does not possess is its ability to admit the ultra-violet rays of sunlight.

"Already it is being worn in goggles by workmen whose eyes would otherwise be endangered by flying sparks and pieces of metal," Mr. Walker stated. "Even spectacles are being made of it, their lenses ground to prescription like those of ordinary eye-glasses."

Since the colour is an inherent part of a plastic, a motorcar constructed of this type of substance will need no paint and there will be no danger of the finish fading or chipping. This should tend to lower the car's production costs.

Mr. Walker declared that his glimpse into the future,

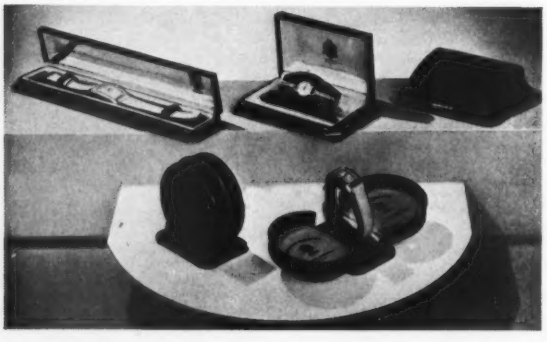


An artist's conception of the moulded plastic car of to-morrow —or maybe the day after!

in which he sees bodies built up of complete mouldings, was not pure fantasy. It is justified, he believes, by certain indications and actualities. He quoted from a recent paper on plastics, read before a scientific body by Dr. Gordon M. Kline, of the United States Bureau of Standards, who declared, "Plastic fenders and a moulded body still remain as the greatest prospective field for extension of plastics in automobiles." In another statement Dr. Kline stated, in discussing the development of plastics, "From collars and cuffs to airplanes and furniture is a big growth for only seventy years' growth of an industry. When it is realized that the major portion of this metamorphosis took place during the streamlining thirties, the present position of plastics development is even more astounding. What the forties will bring is still to be revealed, but certainly the recent emphasis on fully automatic moulding with its attendant improvement in the quality of mouldings and the intensive search for plastics suitable for structural parts will be important factors in guiding the progress of plastics during the new decade." We might mention that news has just come to hand about a complete plastic car body which Bakelite, Ltd., of U.S.A., is said to be working on for Mr. Ford, who, it will be remembered, has for some years now taken a very great interest in the development of soybean plastics for large scale mouldings.

MOULDED WATCH CASES

MOULDED plastic packages were a startling innovation in the fine watch and jewellery field only a few years ago. To-day they are an accepted standard in the industry. Yet the Gruen line of packages were selected by the judges of the All-America Package Competition, 1939, because, in a field where high standards exist, these packages were still outstanding. Each package in the line is designed to serve both as an exquisite gift container and as an attractive display box. Plastics were naturally selected because they could be handled continuously without showing wear, because they could be easily kept clean or easily cleaned if soiled on handling and, finally, because they provided the finest available means of setting off the exquisite detail of the individual watch designs with their own rich designs and colour. Perhaps outstanding in the range of moulded boxes is the clam shell type of box designed to hold a curved-face watch. The two circular sides of the box are hinged so that when opened they stand parallel to each other and at right angles to a velvet-covered band holding the watch itself. The round flanking portions of the package are used to hold small printed legends descriptive of the watch and are so hinged as to rest, when opened, at the proper angle for easy reading from the consumer's eye level. A patented type of moulded hinge construction is utilized which predetermines the angle of opening of each of the package hinges and eliminates the necessity for metal catches on the front of each package as well as for projecting metal hinges at the rear.



A selection of moulded watch cases which received mention in the All-America Package Competition of 1939.

The boxes illustrated were all moulded by Rathbun Molding Corp. and the moulding material was Plaskon, supplied by Plaskon Co. Inc., U.S.A.

In this country both celluloid and cellulose acetate have been used to a small extent for tiny cases, but only a very limited use has been made of the thermo-setting resins for really high-class and expensive jewellery lines. In view of the growing shortage of both metal and wood it is likely that more extensive use will be made of plastics for packaging jewellery.

JABROC for Press Tools

A reversal of custom. Resin impregnated wood veneers are here employed as formers to shape metal sheet

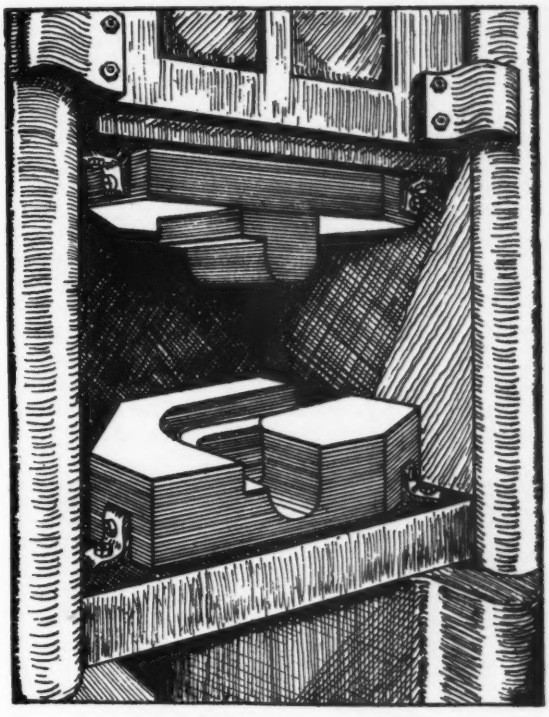
WE have often given publicity in this journal to what are known as the laminated plastics—the resin impregnated and compressed papers for wall-panel and table-top fabrication, resin impregnated fabrics for airscrew, gear and bearing production and resin-impregnated wood for similar industrial manufacture, including electrical components.

The last year has seen the use of the resin impregnated wood type of structural material for yet another important purpose—that of fabrication of press tools. Thus, for the first time, the tables have been reversed and moulds made from plastic material are being used for the moulding or rather forming of metal sheet.

Jabroc, the material under discussion, is produced by Moulded Components (Jablo) Ltd., and its manufacture appears to follow closely that of materials we have already described. Thin veneers of specially selected Canadian birch are impregnated with phenol-formaldehyde resin by means of an alcoholic solution and a number of these sheets are compressed under heat and so consolidated to form a tough block of "densified ply-wood" with a specific gravity of 1.3-1.4 and a very high compressive strength (about 40,000 lb. per sq. in.). At the same time, moisture absorption is completely eliminated so that distortion due to such a cause is avoided. Like other similar materials, Jabroc can be machined readily into any desired shape. Size and thickness of the finished component is limited only by the size of the press employed.

In general, Jabroc is widely employed for making aircraft parts, electrical equipment, etc.

In view of its high compressive strength and the ease with which it can be machined, Jabroc is an ideal material, as we have already indicated, for the fabrication of metal pressing tools and is so being employed in several aircraft factories for turning out aluminium, aluminium alloy and steel sheet pressings. Its advantages are especially manifest in the aircraft industry, where production is not mass production, where design changes rapidly and where designs may even be discarded before production actually takes place. Hitherto, large, heavy and costly castings have been employed,



Close-up of the Jabroc press tools *in situ*.

and since the casting must be followed by slow and expensive machining, the discarding of such castings by sudden change in design is a costly and time-wasting matter.

Jabroc, on the other hand, is rapidly machined and also possesses the advantage of being one-fifth to one-sixth the weight of the metal used for casting and, although Jabroc, considered as a raw material, is more costly, yet there is a final lower cost in the saving of time and labour of machining. The plastic mould is cheaper than the metal one.

The first question that arises is regarding the life of such a tool. This, in view of the stresses to which it is subjected, is surprisingly high. As many as 2,000 pressings have been turned out from one Jabroc mould without the necessity of alteration. On occasion, such as when extra strength is needed at sharp corners, Jabroc moulds are built with metal strips incorporated at such points.

We understand, too. that thick curved blocks of Jabroc are being used as a former for copper sheet beating.

Plastic Belts

The plastic belt has been enthusiastically received by American fashion experts because of its transparency, colour and general novelty. Apart, however, from appearances, the cellulose-acetate material stands up extremely well to hard wear and can be relied upon to give good service. Monsanto Chemical Co., as manufacturers of cellulose acetate, has taken a prominent part in developing this dress novelty.

Ideas—

By the EDITOR

Radio Cabinet Design

I'm sorry to be grousing continually over the poverty of design of British moulded cabinets and to hold up the Americans almost as paragons in this respect, but they are much more venturesome over the other side. A recent issue of *Modern Plastics* showed a radio cabinet, moulded by Firestone Rubber Co., of very original design, as will be seen from the accompanying photograph. It is sold in two colours, being moulded in ivory Beetle and walnut Durez, and was designed by two American artists, Barnes and

Reinecke. A noteworthy point about this and many other modern American designs is the gradual elimination of the front grille. This, in the present type, is removed to the top and, although somewhat reminiscent of a chimney cowl or ventilator, is attractive because of its originality.

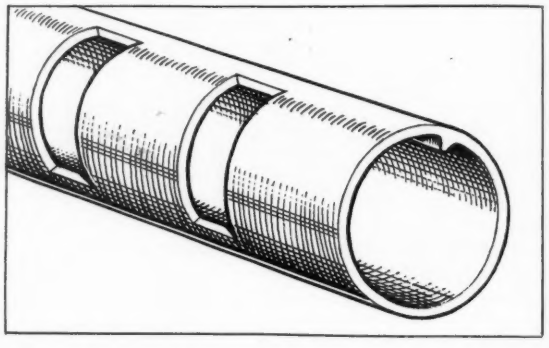
Butter Dishes

Readers will remember I mentioned that, because of war and food restrictions, a good many would-be inventors and idea-vendors want plastic moulders to put on the market little sugar containers, so that the sweet-toothed can augment the very small ration doled out to them in restaurants. Within the last week two people have rung me up to know whether there are any plastic containers for holding butter. We shall soon be walking grocery shops if we adopt all these ideas.

However, I do not believe the plastics industry has ever advocated the use of "phenol" or "urea" resins for the purpose. I seem to remember that Runcolite, Ltd., put on the market a glass-lined plastic butter container. There must be many moulded boxes which would do without having recourse to a new design, if the purpose were merely for home use. We do not know of any existing design which would be suitable for carrying butter about, least of all in warm weather.

Loose-leaved Ledgers

While on a visit last week to the office of a friend in the plastic moulding industry I found him in consultation with a gentleman in the "ledger" industry and discussing a tube resembling, in general form, the drawing I have made. It is a new idea originally intended to be manufactured in steel, but restrictions have made him turn for possible production to plastics. It was agreed that, economically and practically, extrusion in cellulose acetate would be the best method and the best material to use. The profile would present no difficulty, even with the longitudinal stop which acts as a locking device. The slots could be cut



after the tube had been extruded. It had been suggested that the job could be done from the sheet, folded into tube form and "welded," but I should think the extruded tube would be much better since it could be made thicker.

Unfortunately there are few concerns extruding tubes and we wonder whether the whole idea is not one for the after-the-war period.

Bullet-proof Tanks

Our recent notes on this subject brought us a visit from a man who is interested in this subject—presumably there are dozens at work on the job. He is anxious to know the methods of jointing the synthetic rubbers and rubber-like materials which are insoluble in petrol, and which are used as the inner lining of the tank. Synthetic rubbers and the neoprene type can be "welded," but the process is not easy and the raw material has generally to be compounded with rubber before a reasonable "weld" will take place. He is not interested in this method but in one in which a synthetic rubber solution can be applied. The only possible method I know is to dissolve the synthetic material in one of the chlorinated solvents. This is not easy and takes time, but it can be done. The result of application of the solution may or may not be satisfactory, for such a joint becomes a point of attack by petrol. The chlorinated solvent is rarely completely evaporated, and since solution means the "opening up" of the rubber molecules, petrol may leak through at the joint. Still, it is a matter of experiment.

It might be possible, with a specially designed joint, to spray Thiokol powder by the pistol method.

PRODUCTION

Practical Information dealing with Raw Materials, Moulding and Forming of all types of Plastics—Thermo-Hardening and Thermo-Plastic—Works-Organization, New Plant and Control Apparatus

NOTES AND COMMENTS

Factories and the Black-out

BLACK-OUT problems are so continually with us that it is interesting to read the Proceedings of the Chemical Engineering Group of the Society of Chemical Industry (Vol. 21), which contains a discussion on the above subject. The chief contributor described the three methods of blacking out—(1) the use of screens or blinds, (2) the painting of all windows with an opaque film and (3) the use of complementary lighting. With regard to the second he mentioned that an interesting point was the use of aluminium paint which, while it prevented the passage of light, its reflecting power improved the general brightness of a room. He also described the use of luminous pigments for various purposes within the works.

Another speaker discussed the vital problem of ventilation and related experience in his own works where, following "black-out" steps, the health of the operatives was affected and it had been necessary to carry out considerable alterations to make ventilation satisfactory. It was certainly necessary that ventilators should be light-traps as well as ventilators. This question of emission of light from ventilators was important where there was fume or steam in the building. This, in some cases, led to a glow from the ventilator which could easily be seen on a dark night. In the case of ventilation on the side of the building, a simple form of ventilator had been devised. A number of windows were taken out and "air scoops" put in their place. A shield of metal was put round the opening where the window had been. This was closed at the top and left open at the bottom, but care was taken to carry the shield down below the level of the window opening. In this way, obscuration was obtained, and good ventilation through the building resulted. Although it was possible to have good artificial lighting by day and night, combined with an effective system of black-out, his experience showed that the hours of daylight were seriously missed; indeed, it was found very desirable in some processes to make arrangements whereby a reasonable amount of daylight was allowed to enter the buildings. Consideration was being given to a scheme for the use of shutters which could be removed or opened during the day and shut again at night.

Another speaker said that in most well-built works about two-thirds of the windows were redundant, could be painted out, still leaving the factory adequately lighted. The remainder of the glasswork could be obscured by movable screens. The painting of machinery with white paint helps considerably.

Mr. E. F. Lougee

WE have received a letter from our old friend Mr. Lougee, Editor of *Modern Plastics*, the well-known American journal, in which he says, "You will doubtless be surprised to learn that I am resigning as Editor of *Modern Plastics* on June 1. I am badly in need of a rest and have decided to seclude myself in my little shack in the woods and write as I please on a free-lance basis. . . . I shall miss the friendly bickerings, the kicks and complaints, the fan mail, the serious questions and the funny ones. But most of all I shall miss the friendly contacts I have enjoyed with you and other good friends. . . . I want to tell you how very much I appreciate the co-operation you have given me during all this time."

It is difficult to say how much we regret his leaving

the journal, for his vivid personality was reflected in it and the lively humorous letters he regularly sent us brought a real joy to us. As for co-operation, he offered it with both hands and it was accepted with gratitude.

We wish him the happiest of retirements, which, for Lougee, merely means a short rest and a plunging into new work with a fine zest. We shall watch his future with great pleasure.

Nixon Nitration Works

We have pleasure in announcing that Punfield and Barstow, Ltd., Basil Works, Westmoreland Road, Queensbury, London, N.W.9, are now the English representatives of Nixon Nitration Works, New Jersey, U.S.A.

Inquiries and Answers

(In Which is Included General Correspondence)

Book Covers

London, E.4.

The Editor, *Plastics*.

Dear Sir,—I noticed your note in the March issue of *Plastics* concerning plastics for book covers and, as you say, normally plastics are too expensive for the purpose. Occasionally, however, in the case of brochures where special effect is desired plastics have proved very useful.

As a matter of interest, I am sending you under separate cover booklets with not only the covers, but

also the binding in plastic as well. No doubt you are already familiar with "Plastoic" binding, produced by Nevetts, Ltd.

For many years past grained ivory celluloid has been used for Prayer Book covers, and an example is shown at the Plastics Centre.

S. B. Turner,
BX Plastics, Ltd.

Flushing Cisterns

Manchester, 3.

The Editor, *Plastics*.

Dear Sir,—Reverting to your letter to us of the 19th ult. and to our reply of the 21st, in connection with "Nilcrode" cisterns, we are pleased to inform you that we have received a communication from the manufacturers informing us that limited supplies of "Nilcrode" cases will shortly be available.

We are communicating with Messrs. Baxendale and Co., Ltd., accordingly.

J. D. Stoward and Co., Ltd.

Acrylic Resins

London.

The Editor, *Plastics*.

Dear Sir,—We are writing to ascertain if you could put us in touch with the manufacturers of a plastic material at the moment being sold for surgical instruments. It is used for instruments such as cheek retractors, tongue depressors, etc., and the whole principle is that light is transmitted through the plastic material and emerges from the end to illuminate the interior of the mouth. The material which we require is, of course, transparent and must be capable of sterilization by boiling without any injurious effect. The material, we believe, can be bought in sheet form of varying thicknesses and can be cut up, turned on a lathe or moulded into the required form.

M. Co., Ltd.

[Editor's Note.—The plastic material described is acrylic resin as typified by Perspex, manufactured by I.C.I. (Plastics), Ltd. We described the use of acrylic resin for surgical purposes in our June, 1939, issue.]

Vent-Axia Fans

Liverpool.

The Editor, *Plastics*.

Dear Sir,—In the April edition of your valuable publication there appears an article on page 79 relating to the Vent-Axia fan marketed by Vent-Axia, Ltd. I am anxious to get in touch with the above firm and would be glad if you would supply their address.

Referring to your article on page 90 under the heading "Inventing Gadgets," I would just like to say how true your remarks are, particularly in dealing with the sales side of marketing an invention. My experience bears out the truth of your remarks in as much that it is not the inventing and bringing an idea to the marketable stage, but the selling of it to the public that becomes the main problem.

How many inventors and designers are salesmen?
As you remark, the way of the inventor is hard!

G. C. Alexander, Manager.
Shakespeare Theatre.

[Editor's Note.—The required address is:—Vent-Axia, Ltd., 9, Victoria Street, London, S.W.1. Mr. Alexander's kind remarks are duly appreciated.]

Corset Steels

Chelsea.

The Editor, *Plastics*.

Dear Sir,—Can you tell us if you know anybody who makes a plastic copy of a corset steel, with hooks and eyes?

We enclose a small sample herewith of material which appears to us to be suitable, as it springs back well and takes a considerable bend. Do you know the name of the maker of this material?

Reliance Rubber Co., Ltd.

[Editor's Note.—This almost provokes a Syd Walkerian sigh—"we do bump into 'em." Our knowledge of this all-embracing subject is very limited. The sample sent is a strip of cellulose acetate. This would do excellently for the simple job of replacing whale-bone or steel in the main part of the corset, provided that it is not washed in boiling water, nor submitted frequently to cleaning by organic solvents. The life of such strips would be very reasonable, especially now that corsets appear to be changed every year or two, and are much more lightly constructed now than formerly—14-in. waists are no longer the fashion.

The snag lies in the "hook and eye" part of the problem. Made of synthetic resin or cellulose acetate, we cannot conceive that they would stand up to the high

tension for any considerable period. On closer examination it might be conceived possible to incorporate a metal hook and eye into the plastic.

Manufacturers of cellulose acetate sheet and fabrication therefrom are given in the Directory in this issue. Inquiries might also be made from the moulding industry.]

Artificial Intestines

Amsterdam.

The Editor, *Plastics*.

Dear Sir,—You will oblige us by stating the names of manufacturers in your country of artificial intestines.

N. V. PACAMY.

[EDITOR'S NOTE.—We presume that the inquirer does not mean artificial intestines to replace human ones lost or damaged, but those used for making sausage skins. We do not ourselves know of manufacturers, but the names of Crampton and Co., Pomona Spice House, Manchester, and Finney and Co., Trentham Street, Cornbrook, Manchester, have been given to us as dealers in the material. They may manufacture or import. Alternatively, inquiries might be made of British Cellophane, Ltd., or Courtaulds, Ltd.

Artificial sausage skins from viscose were first made in the U.S.A. following research by the Mellon Institute. We believe these skins are used only for the large breakfast type of sausage.]

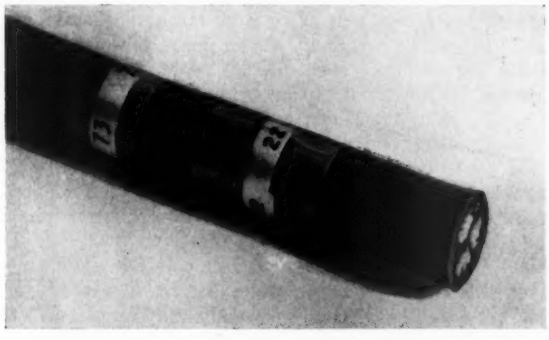
Printed Adhesive Tape for Cable Identification

Southampton.

The Editor, *Plastics*.

Dear Sir,—We have under consideration the question of simplification of cable-end identification on aircraft.

The scheme in mind is to have rolls of cellulose adhesive tape ½ in. wide, printed with black figures at, say, ⅝-in. spacing, on a white background. Each roll



would bear the same number and the numbers required would be up to 80. In application, a short piece of the marked tape is wrapped round the cable, the number then appearing once on the small cables and two or more times on the larger.

Enclosed herewith a sample where we have used typed paper with transparent tape, showing the principle of our proposal. As an alternative, the following might be feasible, i.e., rolls manufactured with the paper in situ, provided the printed paper was finished with an adhesive back so that it adhered as a whole.

We would be glad if you would indicate possible manufacturers. V.A. LTD.

[EDITOR'S NOTE.—We should advise inquirers approaching both the following concerns:—Samuel Jones and Co., Ltd., Bridewell Place, London, E.C.4, and Herts Pharmaceuticals, Ltd., Welwyn Garden City, Herts. The latter concern produces an interesting tape, Lassolastic, which is especially useful for wrapping round rubber. It is, we believe, made from Pliofilm, which is not a cellulose type.

We do not see why the printed paper need be backed by adhesive. The adhesive transparent tape is wide enough to hold the paper in place.]

Export

17, Manchester Square, London, W.1.

The Editor, *Plastics*.

Dear Sir,—For the purpose of our export trade we wish to get in touch with first-class manufacturers of plastics, and should be glad if you could assist us by furnishing us with a list of suitable suppliers, or, alternatively, by informing them of our inquiry, so that the manufacturers can communicate with us direct.

WESTERN-COSMOS, LTD.

[EDITOR'S NOTE.—Will those interested please write direct?]

Books

Croydon.

The Editor, *Plastics*.

Dear Sir,—We note that in the April issue, on page 81 in the article "Synthetic Adhesives," there is a reference made to a book called "Industrial Cold Adhesives," by Roger Dulac. This book seems of interest to us, and we should be glad to know where it can be obtained and also its price. EXPANDED RUBBER CO., LTD.

[EDITOR'S NOTE.—Published by Chas. Griffin and Co., Ltd., 42, Drury Lane, London, W.C.2. Price, 8s. 6d.]

Cellulose Film Adhesive

London, W.C.2.

The Editor, *Plastics*.

Dear Sir,—We would be obliged if you could find out for us whether anybody is known to produce a satisfactory glass transparent glue or artificial resin for the purpose of gluing two sheets of "Cellophane" together. Although viscose can be heat sealed, it is a very unsatisfactory join and should be strengthened by an artificial resin or glue. H. C. INVESTMENTS, LTD.

[EDITOR'S NOTE.—The inquirers might apply to Cellon, Ltd., Richmond Road, Kingston, Surrey, or to Durex Abrasives, Ltd., Arden Road, Adderley Park, Birmingham, 8, for adhesives of this type. The Hercules Powder Co. (English representative: Mr. Cecil Turnbull, 71, Sunny Fields, Lawrence Street, Mill Hill, London, N.W.7) claim satisfactory adhesion of the hot-melt type with the following mixture:—

Ethyl cellulose, 8 per cent.
Castor oil, 30 per cent.
Hydrogenated rosin, 62 per cent.

The mixture has a melting point of 62.5 degrees C.]

Cast Acrylic Resins

Union Society, Oxford.

The Editor, *Plastics*.

Dear Sir,—I have seen what I take to be a cast resin sheet suitable for such purposes as filters for cameras, and am told that it has a "light conductivity factor" higher than that of glass.

I saw this in the United States, and would be interested to know whether there is such a material to be had in this country. J.A.K.

[EDITOR'S NOTE.—We believe the inquirer is referring to Lucite or Crystalite, the American forms of "acrylic" resins. Similar cast material is available in this country under the name of Perspex, manufactured by I.C.I. (Plastics), Ltd., The Hall, Welwyn, Herts.]

PULP, PAPER AND PLASTICS

By Julius Grant, M.Sc., Ph.D., F.I.C.

We take great pleasure in publishing a series of articles by Dr. Grant, one of the foremost technologists in the country on this subject. The opening notes deal with the nature and manufacture of paper and pulp, a close consideration of which is vital to a proper understanding of their combinations with plastic materials. Subsequent articles will deal with (1) *laminated products,* (2) *impregnated products,* (3) *surface coated products,* (4) *fibrous fillers for plastics and* (5) *treatment of paper pulp.*

IT is an interesting sidelight on the ramifications of modern technology that so many points of contact should exist to-day between plastics, which may fitly be described as one of the youngest industries, and paper, which, with equal justification, is regarded as one of the oldest. As a matter of fact, F. Sproxton (*Chem. and Ind.*, 1938, 57, 607) records that the first modern plastic to be discovered (by Schonbein, in 1846) was the nitrocellulose obtained by nitrating paper; and one of the uses suggested for it was for the manufacture of banknotes, a proposition which at the time was considered by John Dickinson, the founder of the present firm of paper-makers bearing that name.

The history of the plastics industry, however, makes it clear that it was not until this early stage in its development had passed that ideas involving the use of paper as an adjunct to plastics developed. This later stage in the history of plastics may be said to date from the discovery of synthetic plastics other than those of the nitrocellulose and casein types, such as the important thermo-setting plastics associated originally with the name of L. H. Baekeland. Nevertheless, although Baekeland announced the discovery of the phenol-formaldehyde resins in 1909, it was not until about 1925 that paper entered into the picture as one of the basic constituents of plastic products. As is well known, this work led to the development of the laminated type of plastic, in which paper or fabric is impregnated with the plastic, the final result being a dense and solid mass having a high mechanical strength, especially toughness and resistance to shock.

Processes of this kind have since undergone considerable developments, and to-day they constitute the most important use of paper in the plastic industry; incidentally, although fabrics are used as well as paper, products containing the latter predominate to the extent of about 70 per cent. There are, however, other uses for paper-plastic combinations, although they serve a somewhat different function. Whereas in laminated products the paper may be said to give special properties to the plastic, in certain of these other methods the reverse applies, i.e., the plastic is used to modify the properties of the paper. An example is a method of "after treatment" of paper, i.e., the pulp or the paper after it is made is treated with the plastic. In this way it is possible to obtain novel decorative effects on paper, or to render it adhesive, waterproof and/or oilproof, etc. Another method represents the youngest development of the paper-plastic combination, the plastic being added to the paper pulp during the process of manufacturing the latter, i.e., before it is made into a sheet. The hardening of the resins may then even be combined with the drying of the paper. In this way complete impregnation of the paper fibres is achieved (as distinct from a surface coating). There are certain technical difficulties, principally of a paper-making nature, to be overcome before this process can be developed to such an extent as to enable relatively large quantities of plastics to be deposited on the fibres. Once these are solved, however, it may even prove possible to use quantities of the plastic of the same order as those found in laminated products, and so to make the equivalent of the latter in one continuous process instead of a combination of one continuous and one discontinuous process. The future prospects of this method, therefore, appear to be promising.

At this stage some understanding of the nature and method of manufacture of pulp and paper are necessary in order to appreciate their function and influence on the manufacture of paper-plastic products. Reference must be made elsewhere for fuller information (see J. Grant, "Wood Pulp," 1938; and J. G. Abel, *Chem. and Ind.*, 1939, 58, 796), but it is desirable to indicate briefly here the nature of the structure of a sheet of pulp or paper.

Paper is essentially a network or mat of cellulose fibres, assembled together more or less densely according to the nature of the paper. These fibres are always of vegetable origin, but by far the most common source of them is wood. Nevertheless, there are at least three important methods of obtaining fibres from wood for the manufacture of paper. One is by mechanical grinding, and, as may be imagined, the resulting product is relatively impure and, consequently, poor in strength; it has no application of any importance in connection with plastics, except perhaps as a filler. The other two methods are chemical processes. In both the non-cellulosic constituents of the wood are removed by digestion under pressure with a chemical, namely, an alkali (caustic soda or a mixture of this with sodium sulphate solution) in one case, or an acid (calcium or magnesium bisulphite solution, containing free sulphur dioxide) in the other. The resulting material is then washed and bleached, and is then known as pulp (see Grant, "Wood Pulp," loc. cit.). It may be dried in sheet form, and sometimes is used in this state for treatment with plastics. More frequently, however, it is converted into paper as outlined below.

Wood, however, is not the only source of cellulose. Rags and cotton linters are of equal importance from the point of view of plastics. In normal times, however, they suffer from the drawback of higher cost, although the resulting paper has the advantages of a high strength and absorbency. When these opposing factors are balanced against one another, cost usually proves to be the deciding factor except for special purposes, e.g., where quality almost regardless of cost is the main feature. Rags and linters are processed by digestion under pressure with hot caustic soda solution, followed by washing and bleaching, and in this way they, too, reach the stage of pulp. Incidentally, cotton linters themselves provide the cellulose for one class of plastics, namely, the cellulose ethers, although the amounts of cellulose used for this purpose are at present very small

compared with those used for the manufacture of paper.

There are other sources of cellulose also. Notable among these are straw, esparto grass, bamboo and many other substances, usually grasses. These are mainly of local importance (e.g., esparto in this country, bamboo in India, and straw in agricultural countries, such as Holland), and as with rags they are very small in quantity compared with wood cellulose. However, no two celluloses of different origins are identical in every respect, and certain of these less abundant types of pulp have been shown to have properties which render them suitable for use in the plastics industry.

Just as cellulose pulps of different origins vary in their characteristics, so also do wood pulps of different kinds. These differences may be of importance from the point of view of plastics. For example, as indicated below, strength and absorbency are important properties from the plastics point of view, and both are affected to a pronounced degree by the method of processing used. An alkaline treatment, for example, helps to retain absorbency with a minimum loss of fibre length, and with this latter property is also associated resistance to tear; this applies particularly to the sulphate process, the alternative name for which, the "kraft process," is self-explanatory. Sulphite pulps are harder and tend to be less absorbent. Similarly, the locality from which the original wood is obtained may also influence the nature of the final pulp. Thus bleached kraft pulps from the western hemlock grown on the West Coast of America are softer and more absorbent than those produced in Northern Europe (cf. L. G. S. Hebbs, *J. Soc. Dyers and Colorists*, 1939, 55, 550).

Within recent years a close study of the technique of pulping methods has enabled manufacturers to alter the character of the pulp from a given wood by modifying the methods of processing (see J. Grant, Introduction to Symposium on Trends of Progress in the Cellulose Industries; *Chem. and Ind.*, 1939, 58, 613). For instance, the isolation of cellulose by the method of chlorination of the wood lignins, followed by dissolution of the resulting soluble chlorination-products, has resulted in pulps in which both strength and colour, and in some cases bulk and absorbency also, are retained. Of even more importance from the standpoint of the plastics industry are the so-called "alpha" pulps, which derive their name from the fact that they contain a high percentage of alpha-cellulose. These are prepared as a rule by further treatment (usually with alkali) of the normal pulps, and they have a very high degree of absorbency and fibre length, which renders them very suitable for impregnation with plastics. Needless to say, the extra processing and drop in yield makes them relatively expensive, and in normal times alpha-pulps derived from wood can overlap rag pulps in respect of price, and they then of course become subject to the same considerations (see above).

It will be appreciated therefore, that the earliest stages in the life of a sheet of paper may be of considerable importance if the paper is to be used in a laminated type of plastic. Of equal if not greater importance is the next operation, that of beating, because it is at this stage that the characteristics of the final paper are developed. In the beating operation a mixture of the pulp with about 20 parts of water is allowed to pass between two parallel sets of metal bars, one on a rotating cylinder and the other fixed in the base of the beater. The rotation of the beater roll also serves to circulate the pulp around the beater, and this circulation is facilitated by the slope of the floor of the beater, so that the beating action is continuous (see J. Grant, "Books and Documents," 1937).

The changes in the fibres which occur during beating have a great influence on the properties of the paper so far as they affect its use for plastics, and they depend, other factors (such as the nature of the pulp) being equal, on the type of bars used, the clearance between the stationary and rotating bars, and the rate at which this is varied. The mechanism of beating is still a matter of dispute between physicists and chemists, but it is convenient to visualize three cases:—

(1) If the bars are sharp and close together the fibres will be cut, as shown in Fig. 1, but otherwise little altered. This is typical of a blotting, or other absorbent type of paper.

(2) If the bars are sharp and not too close together, the fibres will be "scraped," or converted into smaller fibres (fibrillæ), as shown in Fig. 2. Linen fibres fibril-

The effect of altering conditions of beating. Fig. 1.—With bars sharp and close an absorbent paper is produced.

Fig. 2.—With bars sharp and not too close. Cigarette paper is typical of the result.

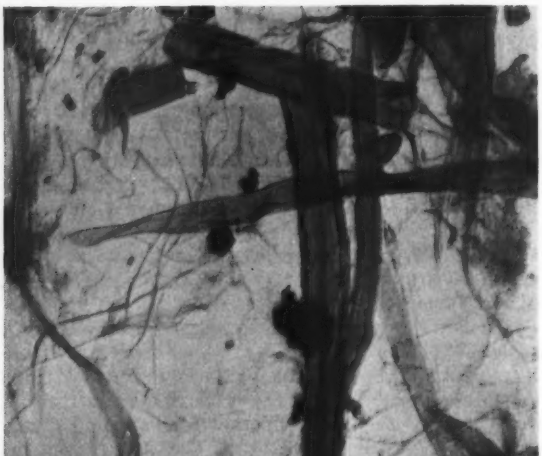


Fig. 3.—With bars close and blunt a resistant sheet results.

("Photos with kind permission of Graham and Co., publishers of Books and Documents.")

late very readily, and such papers are usually very strong; a cigarette paper is an example.

(3) If the bars are blunt and close together the fibres will be beaten by impact. They then absorb water, becoming gelatinous and slimy, and will dry eventually to a hard compact and resistant sheet which, in an extreme case (such as the greaseproof paper represented in Fig. 3), has very little absorbency at all. This form of beating, therefore, is not desirable for paper for laminated plastics, but may be advantageous if the paper has to be coated.

As already indicated, some pulps lend themselves more to one particular type of beating than do others. Thus many sulphite wood pulps hydrate readily, whilst linen is easily fibrillated and cotton is readily cut. Figs. 1 to 3 (reproduced from "Books and Documents" by permission of the publishers) show in fact how the nature of the beating affects the volume of interstibal space available between the fibres, and, consequently, the amount available for the permeation of a plastic.

All the processes described up to now may be regarded as of a "pre-natal" character, and after the pulp has undergone certain minor operations, such as sizing, colouring and loading (if required), the paper is ready to be "born." It is not proposed to deal with this part of the procedure in detail, but some emphasis may be laid on those features which affect the final product from the plastics point of view. As is well known, the diluted pulp flows on to a moving endless band of fine wire mesh, through which most of the water drains leaving a wet mat of pulp; a side-to-side vibration of the wire aligns some of the fibres in the cross direction, and so gives the paper lateral strength. The pulp is removed from the wire on a felt-covered roll ("couching"), and it then passes between several pairs of press-rolls, which consolidate it and remove more moisture by pressure. Too high a degree of compression at this stage will obviously make the sheet denser and remove the interstices between the fibres, thereby leaving less room, so to speak, for the subsequent entry of the impregnating plastic. A balance must be struck, therefore, between the advantages and disadvantages of a high or low pressure.

Similarly with the last operation, that of drying. The paper passes over steam-heated cylinders in such a way that each side of the paper is heated in turn. Here again, heating must be graded if the best results are to be obtained, the temperature being comparatively low in the first cylinders, and then rising to a maximum and falling again at the subsequent driers. It will be apparent from what has already been written that the ease of removal of moisture at this stage will depend largely on the nature of the pulp, and on the method by which it has been beaten.

The above outline is intended to convey some idea of the methods adopted by the paper-maker in order to produce a paper of desired characteristics. Although the types of paper used for plastics are relatively few in number, when a thought is given to the many very different forms which paper can take the great flexibility of the methods of paper manufacture will be appreciated, and we can therefore proceed to consider how the above factors influence the various methods used in the plastics industry.

(To be continued.)

Glyptals in Welding

We have rarely had occasion to mention in these pages the use of the well-known glyptal resins (products of the reaction between glycerine and phthalic anhydride) since their general use so far has been restricted to the formulation of modern varnishes and lacquers.

Recent developments by the General Electric Co. have shown, however, that they are of considerable use in an important engineering sphere, that of welding—to prevent adhesion of "spatter." The above-named company produces three types:—

1. Glyptal No. 1,294 (clear)—To prevent the adhesion of weld spatter.
2. Glyptal No. 1,294 (red)—To prevent the adhesion of weld spatter and also to provide protection against corrosion on surfaces which may not be accessible after welding, such as the overlapped edges of a lap joint.
3. Glyptal No. 1,294 (grey)—To provide all the features of the red variety and having characteristics necessary for use in resistance-welding

Glyptal No. 1,294 (Clear)

The use of Glyptal 1,294 aid saves practically all the time otherwise required for cleaning weld spatter from surfaces which are to be finished. Instead of sticking or partially welding to the protected surfaces, spatter either simply rolls off or it can be brushed away as easily as any loose dirt. In this way, chipping and grinding of weld spatter is avoided and valuable time is saved in finishing operations.

In addition, the film can be applied six months or more prior to welding, without loss of its protective qualities. (Where application for longer periods prior to welding is desired, the red or grey variety is recommended.) Some fabricators prefer to order their steel furnished with the resin applied at the mill.

Unless removed afterwards, the glyptal coating serves as an excellent base or primer for subsequent painting. If removal of the glyptal coating is desired, buffing, shot-blasting, or sand-blasting can be used for economical and successful cleaning.

TRADE AND PERSONAL NOTES

British Standards Institution handbook, dated January, 1940, has now been published and is of special interest in view of the present circumstances. The Chemical Engineering Industry Committee, of which Mr. J. Arthur Reavell is chairman, includes, among many others, Colonel E. Briggs, Dr. F. H. Carr, Sir Alexander Gibb, Mr. F. A. Greene, and Mr. H. Talbot. The Plastics Industry Committee, of which Mr. J. Davidson Pratt is the chairman, includes Mr. G. Dring, Mr. H. V. Potter, Mr. K. M. Chance, and other well-known experts.

The British Standards Institution is the National Standardizing Organization and issues the British Standard Specifications. It is in direct touch with the Standardizing bodies in foreign countries and participates, directly or indirectly, in the work of international standardization as and when industry so desires. The Institution is supported by His Majesty's Government, which contributes a minimum of £3,000 for five years with an offer to increase this as industry increases its proportion. The expenditure is in the nature of £30,000 per annum.

The handbook includes a subject index to the list of British Standards, occupying about 40 pages, a list of new and revised British Standards in course of preparation, and other lists including a mass of valuable information condensed into a very small space. The Handbook occupies 136 pages and is obviously essential to engineers, industrial chemists, and many others engaged in industry.

Federation of British Industries held its annual general meeting on April 10, when Lord Dudley Gordon was elected President. Mr. Peter Bennett, who is now Director-General of the Production of Tanks and Mechanical Transport at the Ministry of Supply, retires after having held office as President of the F.B.I. for two years.

In an interview, Lord Dudley Gordon said that British industry, by closing its ranks and presenting a united and well-organized front, would make certain of success in the opportunities for collaboration that now appeared.

"Notably," he said, "the formation of the Export Council, which followed suggestions made by an F.B.I. deputation to the Prime Minister, gives us real scope for planned co-operation."

Lord Dudley pointed out that on the Export Groups, formed at the initiative of the Export Council, fell the task of organizing the export drive within the particular individual industry concerned. "To this end," he said, "it will be necessary to secure in any particular trade and between individual firms a degree of co-operation rarely achieved under conditions of peace. This is a duty which I feel certain will be efficiently performed by the industrial trade associations.

"And I may add, as was reported to the Grand Council and welcomed by them to-day, the Federation is itself actively assisting its members in the formation of these groups. The F.B.I. is giving advice on procedure and on the appointment of chairmen and secretaries for particular groups, and in certain cases is prepared to provide the necessary secretariat.

"Another important branch of war activity, and one in which the Federation has played its part, is in the mobilization of the industrial resources of the country for the purpose of the rearmament programme. The F.B.I. is in close touch with the Area Organization of the Ministry of Supply and F.B.I. officers are collaborating with the Area Boards and in some cases are members of the Area Committees. This, it is hoped, will facilitate the bringing into production of those firms, especially the smaller firms, which are capable of meeting armament demands, and thus both increasing the output of munitions and providing work for firms whose production has suffered owing to the war.

"Turning to the international sphere, I think I may say that one of the most useful achievements of the Federation itself is the establishment of the Anglo-French Industrial Council, whose object will be to secure the closest possible co-operation between organized industry in Britain and in France. Here, again, if we are to produce lasting results, industry in this country should act in concert.

"Before war broke out," Lord Dudley said, "the F.B.I. was closely concerned with such preparatory measures as the appointment of the Prime Minister's Panel of Industrial Advisers and the arrangements which preceded the formation of the Ministry of Supply. Since the outbreak of war," he added, "the Federation has been in constant contact with Government Departments which, with the greatest goodwill, have discussed possible improvements in the various measures which have a direct impact on industry.

Mr. A. Barclay Inglis has resigned his directorship of British Artid Plastics, Ltd., Slough, and Mr. H. A. Brooks has been appointed to the board in his place.

The British Xylonite Co., Ltd., held their 63rd annual meeting at Hale End on April 30. The Directors' report states that the reorganization of the Company effected on January 1, 1939, has now been in operation for a complete year and the directors are satisfied that the result has been beneficial.

On August 17, 1939, an agreement was signed with the Distillers' Co., Ltd., in accordance with which the capital of B.X. Plastics, Ltd., was increased and 200,000 Ordinary shares in this subsidiary Company were sold to the Distillers' Co., Ltd., for the sum of £400,000, the British Xylonite Co., Ltd., retaining 200,000 6 per cent. Cumulative Preference shares and the remaining 200,000 Ordinary shares. This transaction was completed on September 7, and the price obtained exceeded the book value of £203,918. The net profit for 1939 was £42,480, against £30,835 for 1938. Dividends, 5 per cent. on Preference and 10 per cent. on Ordinary shares.

Lacrinoid Products.—Net profit for 1939 was £8,404; after deducting reserve for tax £3,500, leaving £3,929; dividend 5 per cent. The credit brought forward is £804.

OBITUARY

It is with regret that we announce the death on April 6 of Mr. Edward William Green, who of recent years

had been in charge of the development of Tufnol Bearings, Ellison Insulations, Ltd.

Mr. Green was 40 years of age and served in the last war in the R.F.C. in Mesopotamia.

NEW MATERIALS—NEW PLANT—NEW METHODS

Tung Oil Substitute

Bakelite, Ltd., has just sent us some particulars regarding the use of Bakelite Resin R-10825 as a tung oil substitute. This will, undoubtedly, prove of considerable interest to manufacturers now finding great difficulty in obtaining supplies of tung oil or who find the present high price, £175 a ton, too high to justify its use in varnish and paint formulations.

Although tung oil can be replaced in varnish formulations by dehydrated castor oil and by mixtures of perilla, linseed and oiticica oils, each varnish has to be reformulated and a new manufacturing process worked out. The ideal tung oil would be an oil which could be simply substituted for tung oil, weight for weight, leaving the manufacturing procedure and final properties of the varnish unchanged. Such an ideal substitute is now available, but it can be approximated to very closely by using the special Bakelite resin. By incorporating the oil—reactive and head reactive Bakelite resin with linseed oil, a processed oil is obtained which shows greatly increased activity over linseed oil, together with increased water resistance and durability. This "substitute" oil has only been tested in natural gum varnishes based on ester gum, copal, lime—hardened resin, etc., which are generally used for "stoving" and air-drying primers and undercoats for decorating and general industrial purposes and for finishing enamels. In all these cases the "substitute" varnishes prepared from the "substitute" oil have been found very satisfactory.

The following details are given regarding the manufacture of "substitute" oil. A mixture is made up of 20 parts by weight of Bakelite Resin R-10825 and 80 parts by varnish linseed oil. The oil is first heated to 170 degrees C. and the crushed resin added and well stirred in to give a clear solution. When the resin is completely dissolved, raise the temperature uniformly to 280 degrees C. for 40 minutes. Bakelite, Ltd., state that there is little darkening of the oil and the final viscosity should be 11-14 poises Gardner-Holt at 25 degrees C. Lower viscosities will give slow bodying results in varnishes, and if any difficulty is experienced in reaching the required viscosity the mixture should be held for half an hour at 200 degrees C. before raising to 280 degrees C.

Bull Standard Motors

The Standard Industrial range of A.C. motors includes Squirrel Cage and Slip-ring motors of all types, screen protected, drip-proof, totally enclosed fan cooled, flange mounting and vertical spindle.

These motors have been designed in accordance with the latest practice and they are backed by the Bull tradition of quality and service.

The Standard Squirrel Cage and Slip-ring motors are of sturdy mechanical construction and incorporate many valuable features. The terminal boxes have ample room for connections and the conduit adaptors can be arranged to face in any of four directions. On Squirrel Cage motors the rotors are of die-cast aluminium and on Slip-ring motors the rings are moulded into a Bakelite hub.

Motors in the totally enclosed fan cooled range have all the above features and, as the windings and interior of the motors are completely enclosed, they can be installed almost anywhere. The design is so efficient that fixing centres, centre heights and shaft dimensions are all identical with the screen protected motors of the same horse-power and speed, a feature of very great value to equipment manufacturers who are enabled to use the same bedplates and fixing arrangements regardless of the type of enclosure.

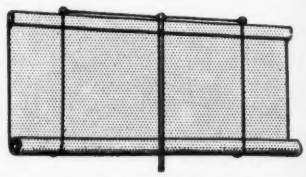
The flange mounting type of motor can be provided in the standard range both for vertical and horizontal fixing. Although the flange mounting motors are not normally held in stock, the demand is such that all the more usual ratings are always in production and very short deliveries can be given.

There is a Bull standard motor for almost every industrial application and the great majority of these motors can either be delivered from stock or in 10 to 14 days, a delivery service which is almost without equal at the present time.

Readers of this journal can obtain full particulars of the complete range of Bull motors on application to Messrs. Bull Motors of Ipswich, who are now able to promise delivery of Standard A.C. motors in about 14 days.

New Black-out Material for Factories

The use of a matt-finished Lancaster cloth which is 100 per cent. opaque and yet light in weight and fully flexible, has received official approval and is now being widely used in many large industrial buildings. Lancaster blindcloth has a much higher degree of opacity than the prescribed Government standard and is available not only in black, but also blue and green, two shades of the latter being obtainable. The lighter shade of green is a particularly pleasant and restful colour and, as it possesses the same degree of opacity as the all-black, its choice for



A simple and yet very effective method of blacking-out a large factory window with Lancaster blindcloth.

blacking-out offices and factories is well worth consideration, especially as it introduces a welcome splash of colour into what is usually a rather depressing scheme of blacking-out.

Lancaster blindcloth is adaptable to all methods of screening windows, fanlights and skylights and its durability and wear-resisting properties are unequalled by any other material. Of particular interest to manufacturers is the fact that by using this high-opacity type of blindcloth it is possible to devise a satisfactory method of blackout without shutting all the windows and so preventing any fresh air from entering the rooms. Messrs. Jas. Williamson and Son, Ltd., Epworth House, 23-35, City Road, London, E.C.1, are the manufacturers of Lancaster blindcloth.

The Cumflow Mixing System

The Cumflow mixer, manufactured by the Liner Concrete Machinery Co., 233, Glasshouse Bridge, City Road, Newcastle-on-Tyne, is a very practical and economical machine of interest to plastic material manufacturers with mixing problems. The system consists of a bladed mixing Star supported eccentrically over a mixing pan. The materials are continuously fed to the Star by the motion of the pan. Both are revolving at speed and achieve the maximum number of points of intersection. Further action is obtained by side blades. The Cumflow mixer ensures no rich or lean parts, no free fall and saves money by its low power and maintenance costs.